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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/556,139	02/09/2007	Tomoo Iijima	050721	2876

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EXAMINER	
SAWYER, STEVEN T	
ART UNIT	PAPER NUMBER
4175	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/556,139	IIJIMA ET AL.	
	Examiner	Art Unit	
	STEVEN SAWYER	4175	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/9/2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 November 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/9/2005 9/14/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 3 and 4 are objected to because of the following informalities: Claims 3 and 4 state, “molten” (page 25, line 25; page 26, line 23). For the purpose of examination this quoted section will be ignored. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. Claims 1, 3, 4, 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, 3, 4, and 5 state, "the interlayer insulating film (claims 3, 4, and 5 state, “non-thermoplastic polyimide layer”) being provided in a portion in which the bumps are not formed on a bump formation surface of the one of the wiring layers and the metal layer for wiring layer formation.” For the purpose of examination, this phrase will be interpreted such that the insulating layer goes around the bumps and does cover the vertical portions of the wiring layers on either side of the bump and the metal layer portion that is not covered by the wiring layers and bumps.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over North Corp. (JP 2001-111189 A) in view of Takubo et al. (US Patent 6329610 B1).

Regarding claim 1 – North Corp teaches a flexible circuit board (fig. 1, 28), comprising: a plurality of bumps (25) which are directly formed on a surface portion of one of a wiring layer (22) and a metal layer (23) for wiring layer formation or formed thereon through an etching barrier layer (22), each of the bumps having an upper surface connected to a wiring film (fig. 4A, 32) of another flexible circuit board (Figure 4 shows an upper and a lower flexible printed circuit board 28); and an interlayer insulating film (27) wherein the interlayer insulating film being provided in a portion in which the bumps are not formed (fig. 1 shows the insulation layer only formed on the sides of the bumps) on a bump formation surface of the one of the wiring layer (fig. 1, 22) and the metal layer (23) for wiring layer formation.

North Corp does not teach wherein the insulating film includes a non-thermoplastic polyimide layer and thermoplastic polyimide layers as bonding agents which are formed on both surface thereof, the interlayer insulating film being provided in a portion in which the bumps are not formed on a bump formation surface of the one of the wiring layer and the metal layer for wiring layer formation, wherein one of the thermoplastic polyimide layers of the interlayer insulating film which is located on an opposed side of the one of the wiring layer and the metal layer for wiring layer formation is thicker than the other of the thermoplastic polyimide layers.

Takubo teaches a flexible circuit board wherein the insulating film (fig. 4F, 21, 22, 23) includes a non-thermoplastic polyimide layer (23, [column 21 lines 57-58] Takubo states, “epoxy denatured polyimide type resin sheet”, this is a non-thermoplastic polyimide) and thermoplastic polyimide layers (21 and 23, [column 21 lines 7-9] Takubo states, “one of various bonding sheets, or thermoplastic film may be used instead of bismaleimide type polyimide resin”) as bonding agents which are formed on both surface thereof (see fig. 4F), wherein one of the thermoplastic polyimide layers (21) of the interlayer insulating film is thicker than the other of the thermoplastic polyimide layers (22).

It would have been obvious to a person having ordinary skill in the art at the time of invention to modify the flexible circuit board taught by North Corp with the insulation film taught by Takubo because Takubo states, “a flexible wiring substrate that is suitable for a laminate of layers can be accomplished. In particular, a flexible substrate with a high boding strength to a rigid wiring substrate or another flexible substrate can be accomplished" [column 30 line 42-46].

Regarding claim 2 – North Corp teaches a method of manufacturing a flexible circuit board, comprising: preparing one of a wiring layer (fig. 1, 22) and a metal layer (23) for wiring layer formation in which a plurality of bumps (25) are directly formed on a surface portion thereof or formed thereon through an etching barrier layer (22); and pressurization-bonding (North Corp states that the interlayer is formed by, “lamination pressurization” [claim 9]) an interlayer insulating film (27) and a bump formation surface

of the one of the wiring layer and the metal layer for wiring layer formation such that each of the bumps passes through the interlayer insulating film in a direction in which a the layer faces the bump formation surface (see fig. 1g).

North Corp does not teach the thermoplastic polyimide layers as bonding agents which have thicknesses different from each other and are formed on both surface of a non-thermoplastic polyimide layer in addition the thinner thermoplastic polyimide layer faces the bump formation surface.

Takubo teaches a flexible circuit board (fig. 4F) which have thermoplastic polyimide layers (21, 22) as bonding agents which have thicknesses different from each other and are formed on both surface of a non-thermoplastic polyimide layer (23) in addition the thinner thermoplastic polyimide layer (22) faces the bump formation surface (13a, 13b).

It would have been obvious to a person having ordinary skill in the art at the time of invention to modify the flexible circuit board taught by North Corp with the insulation film taught by Takubo because Takubo states, “a flexible wiring substrate that is suitable for a laminate of layers can be accomplished. In particular, a flexible substrate with a high boding strength to a rigid wiring substrate or another flexible substrate can be accomplished" [column 30 line 42-46].

Regarding claim 3 – North Corp teaches a flexible multi-layer wiring circuit board comprising: a flexible circuit board (fig. 1) in which a plurality of bumps (25) are directly formed on a surface portion of one of a wiring layer (22) and a metal layer (23) for wiring

layer formation or formed thereon through an etching barrier layer (22), an interlayer insulating film (27) in which the bumps are not formed on (fig. 1G shows bumps not being formed on the insulation film) a bump formation surface of the one of the wiring layer and the metal layer for wiring layer formation; and an another flexible circuit board (fig. 4a, 33) different from the flexible circuit board, in which wiring layers (32) are formed on at least one main surface (fig. 3a, 32 shows an upper and lower surface with wiring layers), at least a part of each of the wiring layers is connected to an upper surface of each of the bumps (fig. 4B shows the bumps being connected to the second circuit boards wiring layers); and a space between the wiring layers on the one main surface is filled with a insulating layer (fig. 1G, 27 shows the wiring layers covered by insulation).

North Corp does not teach thermoplastic polyimide layers as bonding agents are formed on both surface of a non-thermoplastic polyimide layer is provided in a portion and one of the thermoplastic polyimide layers of the interlayer insulating film which is located on an opposed side of the one of the wiring layer and the metal layer for wiring layer formation is thicker than the other of the thermoplastic polyimide layers; and a space between the wiring layers on the one main surface is filled with a thicker thermoplastic polyimide layer molten.

Takubo teaches thermoplastic polyimide layers (fig. 4F, 21 and 22) as bonding agents are formed on both surface of a non-thermoplastic polyimide layer (23) is provided in a portion where the bumps (33) are not formed and one of the thermoplastic polyimide layers (21) of the interlayer insulating film which is located on an opposed

side of the one of the wiring layer and the metal layer for wiring layer formation is thicker than the other of the thermoplastic polyimide layers (Fig. 4F shows layer 21 to be thicker than layer 22).

It would have been obvious to a person having ordinary skill in the art at the time of invention to modify the flexible circuit board taught by North Corp with the insulation film taught by Takubo because Takubo states, “a flexible wiring substrate that is suitable for a laminate of layers can be accomplished. In particular, a flexible substrate with a high boding strength to a rigid wiring substrate or another flexible substrate can be accomplished" [column 30 line 42-46].

Regarding claim 4 – North Corp teaches a method of manufacturing a flexible multi-layer wiring circuit board, comprising: preparing: a first flexible circuitboard (fig. 1) in which a plurality of bumps (25) are directly formed on a surface portion of one of a wiring layer (22) and a metal layer (23) for wiring layer formation or formed thereon through an etching barrier layer (22), an interlayer insulating film (27) and a second flexible circuit board (fig. 4A, 33) in which wiring layers (32) are formed on at least one main surface thereof; and performing heating-pressurization (Discussed in the rejection to claim 2) processing for connecting at least a part of each of the wiring layers formed on the one main surface of the second flexible circuit board to an upper surface of each of the bumps (see fig. 4B) and filling a space between the wiring layers on the one main surface with a insulation layer(Fig. 4B shows the insulation layer (27) covering the wiring layers (32).

North Corp does not teach wherein thermoplastic polyimide layers (fig. 4F, 21 and 22) as bonding agents are formed on both surface of a non-thermoplastic polyimide layer (23) is provided in a portion in which the bumps (33) are not formed on a bump formation surface of the one of the wiring layer and the metal layer for wiring layer formation, and one of the thermoplastic polyimide layers (21) of the interlayer insulating film which is located on an opposed side of the one of the wiring layer (13a and 13b) and the metal layer (47) for wiring layer formation is thicker than the other of the thermoplastic polyimide layers.

It would have been obvious to a person having ordinary skill in the art at the time of invention to modify the flexible circuit board taught by North Corp with the insulation film taught by Takubo because Takubo states, “a flexible wiring substrate that is suitable for a laminate of layers can be accomplished. In particular, a flexible substrate with a high boding strength to a rigid wiring substrate or another flexible substrate can be accomplished" [column 30 line 42-46].

Regarding claim 5 – North Corp teaches a method of manufacturing a flexible multi-layer wiring circuit board, comprising: preparing: two first flexible circuit boards (fig. 4a, 28), in each of which a plurality of bumps (fig. 1, 25) are directly formed on a surface portion of one of a wiring layer (22) and a metal layer (23) for wiring layer formation or formed thereon through an etching barrier layer (22), an interlayer insulating film (27) and a second flexible circuit board (fig. 4, 33) in which wiring layers (31 and 32) are formed on both surfaces thereof; and performing heating-pressurization (Discussed in

the rejection to claim 2) processing for connecting the wiring layers formed on the both surfaces of the second flexible circuit board to upper surfaces of the bumps of the two first flexible circuit boards (fig. 4a shows the two flexible circuit boards 28 being pressed into the second circuit board 33) and filling a space between the wiring layers of the second flexible circuit board with a insulation layer (fig. 1, 27) of each of the first flexible circuit boards.

North Corp does not teach an insulation film wherein thermoplastic polyimide layers as bonding agents are formed on both surface of a non-thermoplastic polyimide layer is provided in a portion in which the bumps are not formed on a bump formation surface of the one of the wiring layer and the metal layer for wiring layer formation, and one of the thermoplastic polyimide layers of the interlayer insulating film which is located on an opposed side of the one of the wiring layer and the metal layer for wiring layer formation is thicker than the other of the thermoplastic polyimide layers.

Takubo teaches an insulation film (fig. 4F) wherein thermoplastic polyimide layers (21 and 22) as bonding agents are formed on both surface of a non-thermoplastic polyimide (23) layer is provided in a portion in which the bumps (33, 32, 31) are not formed on a bump formation surface of the one of the wiring layer (13a and 13b) for wiring layer formation, and one of the thermoplastic polyimide layers (21) of the interlayer insulating film which is located on an opposed side of the one of the wiring layer (13a and 13b) and the metal layer (47) for wiring layer formation is thicker than the other of the thermoplastic polyimide layers (Fig. 4F shows an insulating film that has a thicker layer and a thinner layer that sandwich a non-thermoplastic layer).

It would have been obvious to a person having ordinary skill in the art at the time of invention to modify the flexible circuit board taught by North Corp with the insulation film taught by Takubo because Takubo states, “a flexible wiring substrate that is suitable for a laminate of layers can be accomplished. In particular, a flexible substrate with a high boding strength to a rigid wiring substrate or another flexible substrate can be accomplished" [column 30 line 42-46].

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Narushima et al. (US Patent 6426138 B1) discloses an adhesive film for electronic parts.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to STEVEN SAWYER whose telephone number is (571)270-5469. The examiner can normally be reached on Mon-Thu 7:00-5:30 (est).

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Mark Robinson can be reached on 5712722319. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. S./
Examiner, Art Unit 4175
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